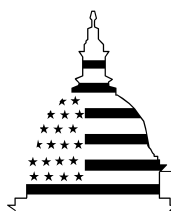


April 2006

# CHEMICAL AND BIOLOGICAL DEFENSE

## DOD Needs Consistent Policies and Clear Processes to Address the Survivability of Weapon Systems Against Chemical and Biological Threats



G A O

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Highlights of [GAO-06-592](#), a report to congressional committees

## Why GAO Did This Study

The possibility that an adversary may use chemical or biological weapons against U.S. forces makes it important for a weapon system to be able to survive such attacks. In the National Defense Authorization Act for Fiscal Year 2005, Congress mandated that the Department of Defense submit a plan to address weapon system chemical and biological survivability by February 28, 2005. This plan was to include developing a centralized database with information about the effects of chemical and biological agents on materials used in weapon systems. DOD did not submit its plan as mandated. GAO was asked to evaluate (1) the extent to which DOD addresses weapon system chemical and biological survivability during the acquisition process, and (2) DOD's internal controls for maintaining a comprehensive database that includes chemical and biological survivability research and test data for weapon system design and development.

## What GAO Recommends

GAO is recommending modifications to DOD's current weapon system acquisition policy to ensure that (1) weapon system chemical and biological survivability is consistently addressed and (2) that DOD's chemical and biological scientific and technical information database is comprehensive. DOD concurred with GAO's recommendations and currently has actions underway for their implementation.

[www.gao.gov/cgi-bin/getrpt?GAO-06-592](http://www.gao.gov/cgi-bin/getrpt?GAO-06-592).

To view the full product, including the scope and methodology, click on the link above. For more information, contact Davi D'Agostino at (202) 512-5431 or [dagostinod@gao.gov](mailto:dagostinod@gao.gov).

# CHEMICAL AND BIOLOGICAL DEFENSE

## DOD Needs Consistent Policies and Clear Processes to Address the Survivability of Weapon Systems Against Chemical and Biological Threats

### What GAO Found

The extent to which chemical and biological survivability is considered in the weapon system acquisition process is mixed and varied. Although DOD strategic guidance and policy has emphasized the growing threat of an adversary's use of chemical and biological weapons for over a decade, DOD, joint, and military service weapon system acquisition policies are inconsistent and do not establish a clear process for considering and testing system chemical and biological survivability. To assess the extent DOD addresses chemical and biological survivability during the acquisition process, GAO conducted a non probability sample of nine major weapon systems based on high dollar value, whether the system was a joint program, and risk of exposure to chemical and biological weapons. Because DOD and joint acquisition policies do not require that survivability be specifically addressed, the military services have developed their own varying and unique policies. Thus, for the nine weapon systems GAO reviewed, the program offices involved made individual survivability decisions, resulting in inconsistent survivability consideration and testing. In the absence of DOD requirements, program offices also inconsistently document their decisions regarding how they consider and test chemical and biological survivability. Furthermore, DOD policies do not establish a clear process for responsibility, authority, and oversight for monitoring program office decisions regarding chemical and biological survivability. Without establishing consistent policies requiring that chemical and biological survivability be considered during weapon system acquisition, and a clear process for doing so, military planners and commanders are likely to face varying weapon system performance, availability, and interoperability issues. These could negatively affect system availability in a contaminated environment and limit DOD's ability to identify risk and ensure that appropriate decisions are made.

DOD, through its Defense Technical Information Center (DTIC), maintains a centralized database for science and technology information that could facilitate program offices' consideration of weapon system chemical and biological survivability, but the comprehensiveness of this database is unknown due to inadequate internal controls. It is unlikely that the DTIC database contains fully comprehensive information about this for three reasons. First, it is unclear whether this information is covered by the broad DOD policy directing that scientific and technical information be submitted to DTIC. Second, there is no established process for submitting scientific and technical information to DTIC. As a result, it is submitted to DTIC through the ad hoc actions of individual personnel and organizations, and some DOD officials expressed concern that not all information is being submitted to DTIC. Third, no office or organization in DOD has been given clear oversight responsibility to ensure that information is submitted to DTIC. The lack of a database with comprehensive information about weapon system chemical and biological survivability creates the risk of unnecessary expenditures on duplicative testing.

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# Contents

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|   |    |
|---|----|
| Letter  | 1  |
| Results in Brief  | 3  |
| Background  | 5  |
| DOD and the Military Services Do Not Consistently Address Weapon System Chemical and Biological Survivability   | 9  |
| Comprehensiveness of Chemical and Biological Survivability Information in DOD's Centralized Database Is Unknown | 13 |
| Conclusions   | 15 |
| Recommendations for Executive Action  | 15 |
| Agency Comments and Our Evaluation  | 16 |

---

|  |    |
|--|----|
| Appendixes   |    |
| Appendix I: Scope and Methodology  | 19 |
| Appendix II: Sampled Weapon System Programs Either Conducted or Considered Some Level of Chemical and Biological Survivability Testing | 21 |
| Appendix III: Comments from the Department of Defense  | 26 |
| Appendix IV: GAO Contact and Staff Acknowledgments   | 29 |

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|   |    |
|---|----|
| Figures   |    |
| Figure 1: Intended Flow of Documents Containing Technical Data Related to Chemical and Biological Contamination Survivability | 8  |
| Figure 2: Chemical and Biological Testing Performed on Sampled Weapon Systems   | 22 |

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## Abbreviations

|       |   |
|-------|---|
| CBIAC | Chemical and Biological Information Analysis Center |
| DOD   | Department of Defense                               |
| DTIC  | Defense Technical Information Center                |

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United States Government Accountability Office  
Washington, D.C. 20548

April 28, 2006

## Congressional Committees

The Department of Defense (DOD) believes that an adversary may use chemical or biological weapons against U.S. forces to respond to our superior conventional warfare capabilities and potentially gain an advantage on the battlefield. This increases the importance of considering a weapon system's ability to survive chemical and biological attacks as part of its design and development. DOD's investment of billions of dollars in modern weapon systems makes it critical that equipment can continue to operate after a battlefield is contaminated and can be reused after undergoing decontamination procedures.

DOD and service policies consider chemical and biological survivability to be the capability of a system and its crew to withstand a chemically or biologically contaminated environment without losing the ability to accomplish the assigned mission. This capability includes a weapon system's ability to withstand chemical or biological decontamination, a process that may itself be caustic, corrosive, or otherwise harmful to the system. Throughout this report, we will refer to this issue as weapon system chemical and biological survivability.

This report updates aspects of our prior work and is intended to help facilitate DOD's efforts to address chemical and biological survivability in its weapon system acquisition process. Both GAO's and DOD's Inspectors General have previously reported on problems regarding this aspect of weapon system acquisition. For example, in 2003 we reported that DOD had not developed a systematic approach for ensuring that the services appropriately incorporate chemical and biological survivability into weapon system design and testing.<sup>1</sup> In the National Defense Authorization

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<sup>1</sup>GAO, *Chemical and Biological Defense: Sustained Leadership Attention Needed to Resolve Operational and System Survivability Concerns* (May 30, 2003).

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Act for Fiscal Year 2005,<sup>2</sup> Congress mandated that DOD submit a plan for addressing such survivability by February 28, 2005. This plan was to include development of a centralized database containing comprehensive information about the effects of chemical and biological agents and contaminants on the materials used in weapon systems. In addition, the Senate Armed Services Committee directed that we evaluate DOD's plan and report our findings to Congress within 180 days of the plan's submission. As of April 3, 2006, DOD has not submitted the mandated plan. On August 2, 2005, DOD provided Congress with an interim report in partial response to the congressional mandate. The interim report indicated that DOD may not fully address the mandate until the end of fiscal year 2007. In anticipation of receiving DOD's plan and to provide a foundation for our review you asked us to examine DOD's existing policies and processes for considering chemical and biological survivability of weapon systems, and to assess the status of DOD's efforts to create a centralized chemical and biological effects database. Our objectives were to evaluate (1) the extent to which DOD addresses weapon system chemical and biological survivability during the acquisition process, and (2) DOD's internal controls for maintaining a comprehensive database that includes chemical and biological survivability research and test data for weapon system design and development.

To examine the extent to which DOD addresses weapon system chemical and biological survivability during the acquisition process, we reviewed DOD, joint staff, and service policies, guidance, and procedures and obtained documentation and interviewed officials throughout DOD and at program offices from a non probability sample of nine major weapon systems based on several factors including (1) high dollar value (2) whether the system is a joint program, and (3) risk of exposure to chemical and biological weapons.<sup>3</sup> To evaluate the adequacy of DOD's internal controls for maintaining a comprehensive database that facilitates the inclusion of chemical and biological survivability in weapon system design and development, we reviewed DOD and service policies, guidance, and procedures and conducted interviews with database officials, officials at the weapon system program offices we visited, and members of the chemical and biological testing community. We compared these policies,

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<sup>2</sup>Pub. L. No. 108-375, § 1053 (Oct. 28, 2004).

<sup>3</sup>Because the sample is a non probability sample, it cannot be used to make generalizations about weapon system program office acquisition, testing, or database submission practices.

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guidance, and procedures to the objectives and fundamental concepts of internal controls defined in *Standards for Internal Control in the Federal Government*.<sup>4</sup> We conducted our review from February 2005 through January 2006 in accordance with generally accepted government auditing standards. More detailed information on our scope and methodology is provided in appendix I.

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## Results in Brief

DOD, joint, and military service weapon system acquisition policies inconsistently address and do not establish a clear process for considering and testing system chemical and biological survivability.<sup>5</sup> Although DOD strategic guidance and policy have for the last decade repeatedly emphasized the growing threat of an adversary's use of chemical and biological weapons, DOD and joint acquisition policies currently do not require that survivability be specifically addressed, and the military services have developed their own varying and unique policies. In the absence of consistent policies from DOD and the services, the nine weapon system program offices we reviewed made inconsistent decisions in their consideration and testing of weapon system survivability, even for similar systems. For example, the program offices for the three land systems we reviewed each conducted very different tests, even though all three systems are intended for the same operating environment. Similarly, the program offices for the nine weapon systems we reviewed did not consistently document their chemical and biological survivability decisions because of the absence of a DOD or joint requirement for them to do so. Although the program offices could provide documentation regarding what chemical and biological survivability testing was conducted, they did not have a consistent method to track what was considered or not included. Furthermore, DOD is unable to exercise oversight of program office decisions regarding weapon system chemical and biological survivability because DOD and service policies have not established a clear oversight process for monitoring these decisions. According to DOD officials, chemical and biological survivability is not usually a key performance

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<sup>4</sup>GAO, *Standards for Internal Control in the Federal Government*, [GAO/AIMD-00-21.3.1](#) (Washington, D.C.: November 1999).

<sup>5</sup>In commenting on this report DOD noted, and we agree, that the Army has a long-standing policy in place for addressing weapon system nuclear, biological, and chemical survivability. However, as noted on page 9 Army policies allow service sponsors and program offices to individually decide how and to what extent to consider weapon system survivability during the acquisition process.

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parameter,<sup>6</sup> so the Milestone Decision Authority (MDA)<sup>7</sup> does not provide oversight, and there is no specific chemical and biological survivability Functional Capabilities Board to review program office survivability decisions.

DOD, through the Defense Technical Information Center (DTIC),<sup>8</sup> maintains a centralized database that could facilitate program offices' consideration of weapon system chemical and biological survivability, but the extent to which this database is comprehensive is unknown. Although DOD policy requires DTIC to maintain a comprehensive database of scientific and technical information, it is unlikely that this database contains all DOD-related data about the effects of chemical and biological agents and decontaminants on weapon systems for three reasons. First, it is unclear whether chemical and biological survivability information is covered by the broad DOD policy directing that scientific and technical information be submitted to DTIC. Some DOD officials we interviewed also told us there is disagreement about whether this policy applies to chemical and biological information. Second, there is no established process for submitting scientific and technical information to DTIC. As a result, information is submitted through the ad hoc actions of individual personnel and organizations, and some DOD officials expressed concern that not all the information is being submitted. Third, no office or organization in DOD has been designated as having oversight responsibility to ensure that information is submitted to DTIC. The lack of a database with comprehensive information about weapon system chemical and biological survivability could result in unnecessary expenditures on duplicative testing. For example, if research or testing is performed regarding an aspect of survivability, but its results not entered in the DTIC database, a program office interested in the same research might fail to recognize it had already been performed and cause the same work to be redone.

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<sup>6</sup>Key performance parameters are those attributes or characteristics of a system that are considered critical or essential to the development of an effective military capability and those attributes that make a significant contribution to the key characteristics.

<sup>7</sup>MDA is the designated individual with overall responsibility for a program. The MDA has the authority to approve entry of an acquisition program into the next phase of the acquisition process and is accountable for cost, schedule, and performance reporting to higher authority, including congressional reporting.

<sup>8</sup>DTIC is the central coordinating point for DOD's scientific and technical information databases and systems.



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We are making recommendations for DOD to modify its policy to better ensure that weapon system chemical and biological survivability is consistently addressed in the acquisition process and that DTIC's centralized database contains comprehensive chemical and biological survivability information. In commenting on our draft, DOD agreed with all our recommendations and stated it expects to (1) issue a department Chemical Biological Contamination Policy by May 2006, (2) subsequently draft a DOD Directive addressing Chemical, Biological, Radiological and Nuclear Survivability, and (3) develop a chemical and biological material effects database by the end of Fiscal Year 2007.

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## Background

In the post-Cold War era, the proliferation of chemical and biological weapon technologies in developing countries presents DOD with a national security challenge. The 1997, 2001, and 2006 Quadrennial Defense Reviews as well as other DOD publications have emphasized the need to address the increasing threat posed by the proliferation of weapons of mass destruction, including chemical and biological weapons. The 2006 Quadrennial Defense Review specifically states that DOD's vision is to organize, train, equip, and resource the future force to deal with all aspects of the threat posed by weapons of mass destruction. It notes that DOD has doubled its investment in chemical and biological defenses since 2001, and is increasing funding for its Chemical Biological Defense Program across the Future Years Defense Program by \$2.1 billion (approximately 20 percent). However, experiences during the Persian Gulf War and the preparations for Operation Iraqi Freedom exposed weaknesses in the preparedness of U.S. forces to defend against a chemical or biological attack. In addition, we and DOD's Inspector General have published reports addressing continued problems in aspects of DOD's chemical and biological defense preparedness. Finally, at present there remain disagreements within DOD regarding the nature and extent of the chemical and biological threat and the degree to which major weapon systems should be survivable against such threats and capable of operating in a contaminated environment (see app. II). This lack of agreement could adversely affect DOD's ability to develop and carry out a coherent plan to defend against chemical and biological threats.

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Until 2003, DOD's acquisition procedures<sup>9</sup> (unless waived) required that weapon systems survivability be addressed in accordance with assessed threat levels, including chemical and biological, anticipated in the weapon system's projected operating environment. These procedures defined survivability as the capability of a weapon system and crew to avoid or withstand a man-made hostile environment without suffering an abortive impairment of its ability to accomplish its designated mission. The Army, Navy, and Air Force issued supplemental acquisition policies that established service-specific procedures to address the chemical and biological contamination survivability of their weapon systems. In 2003, DOD replaced its acquisition procedures with a Defense Acquisition Guidebook, which, together with the controlling DOD directive and instruction,<sup>10</sup> no longer specifically requires that weapon system survivability against chemical and biological threats be addressed during the system design and development phase. According to a DOD official, this action was part of a DOD effort to simplify its weapon system acquisition process. The only current DOD acquisition requirement specifically related to chemical and biological threats is that weapon system program offices address protection for crew members (as opposed to the weapon system itself) against the effects of a chemical or biological threat.<sup>11</sup>

As part of weapon system design and development efforts, DOD uses scientific and technical information from research and testing activities to better understand various chemical and biological agents and their impact on military operations, including the survivability of weapon systems. DTIC maintains a centralized database containing a broad range of scientific and technical information intended to maximize the return on investment in research, evaluation, and studies.<sup>12</sup> In addition to its centralized database, DTIC uses the Chemical and Biological Information Analysis Center

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<sup>9</sup>DOD Regulation 5000.2-R, *Mandatory Procedures for Major Defense Acquisition Programs (MDAPS) and Major Automated Information System (MAIS) Acquisition Programs*, Apr. 5, 2002.

<sup>10</sup>See DOD Directive 5000.1, *The Defense Acquisition System*, May 12, 2003; DOD Instruction 5000.2, *Operation of the Defense Acquisition System*, May 12, 2003; *Defense Acquisition Guidebook*, Defense Acquisition University, [www.akss.dau.mil/dag/](http://www.akss.dau.mil/dag/).

<sup>11</sup>Crew members could be protected by such means as individual protective suits and masks, or by air filtration and overpressure built into weapon system crew compartments.

<sup>12</sup>According to DOD Instruction 3200.14, DTIC is the central coordinating point for DOD scientific databases and systems, including those related to chemical and biological data.

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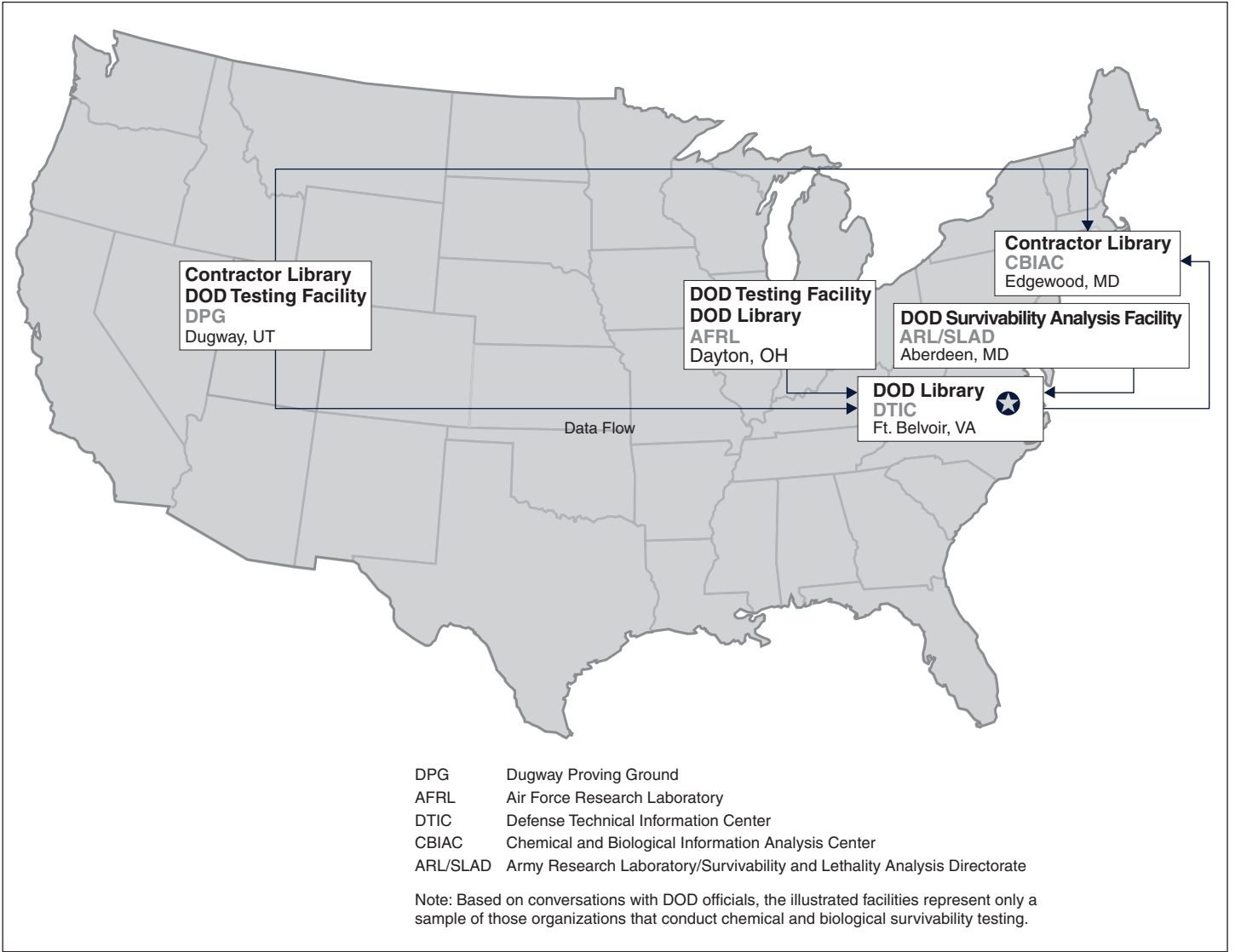
(CBIAC), a contractor-operated information analysis center, to maintain additional databases and provide information specific to chemical and biological issues.<sup>13</sup> DOD indicated in its August 2005 interim report that it intends to build on the existing databases maintained by CBIAC and to develop a centralized database by the end of fiscal year 2007 that contains comprehensive information on the effects of chemical and biological agents and decontaminants on weapon systems.

In executing its role as a coordinating point for DOD scientific and technical information databases and systems, DTIC makes information available throughout DOD. Figure 1 illustrates the intended flow of information among testing facilities, program offices, and DTIC.

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<sup>13</sup>DTIC manages 9 contractor-operated information analysis centers.

**Figure 1: Intended Flow of Documents Containing Technical Data Related to Chemical and Biological Contamination Survivability**



Source: GAO analysis of DOD data.

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## DOD and the Military Services Do Not Consistently Address Weapon System Chemical and Biological Survivability

DOD and the military services do not consistently address weapon system chemical and biological survivability during the acquisition process. In the absence of clear DOD guidance and effective controls, responsibility for decisions regarding weapon system chemical and biological survivability has devolved largely to the individual military services and weapon system program offices. The program offices we visited do not consistently document their chemical and biological survivability decisions, nor is there an established, clear, and effective DOD-level process for the oversight of these decisions.

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## DOD and Service Policies Do Not Establish a Clear Process for Considering and Testing Weapon System Chemical and Biological Survivability

Although emphasis is placed on chemical and biological threats in DOD's strategic guidance, DOD and military service policies do not establish a clear process for considering and testing weapon system chemical and biological survivability. While DOD acquisition policies require that survivability of personnel after exposure to chemical and biological agents be addressed by all weapon system programs, they do not specifically require the consideration of weapon system survivability.<sup>14</sup> There also are no DOD policies regarding the quantity and type of weapon system survivability testing that should be conducted. In addition, joint staff policies do not address or provide specific instruction as to how chemical and biological survivability should be considered during the acquisition process, or how this consideration should be monitored, reviewed, and documented.<sup>15</sup>

Each of the existing service acquisition policies is therefore unique and differs in the extent and amount of detail it requires for considering weapon system chemical and biological survivability. DOD acquisition officials told us that each weapon system service sponsor has the ability to decide whether and to what extent to incorporate survivability testing. Of the military services, the Army has the most detailed policy for addressing this. However, while emphasizing the need to monitor and review chemical and biological survivability issues in general, Army policies allow service sponsors and program offices to individually decide how and to what extent to consider weapon system survivability during the acquisition

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<sup>14</sup>See DOD Directive 5000.1, *The Defense Acquisition System*, May 12, 2003, and DOD Instruction 5000.2, *Operation of the Defense Acquisition System*, May 12, 2003.

<sup>15</sup>See Chairman Joint Chief of Staff Instruction 3170.01E, *Joint Capabilities Integration and Development System*, May 11, 2005.

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process. The Air Force and Navy have less detailed policies and also leave decision making to the weapon system sponsor and program office. Navy officials told us that, in their opinion, having less rigid requirements was advantageous because it reduces system development time and costs.

The extent to which services consider weapon system survivability during the acquisition process is further influenced by differences in how each service perceives the chemical and biological threat and plans to conduct operations in a contaminated environment. The Army focuses on tactical and theater chemical and biological threats against exposed ground combat personnel and equipment. In comparison, the Air Force concept of operations in a contaminated environment is mainly a strategy of avoidance and protection, while the Navy view is that a chemical or biological attack on surface ships is a less likely threat.

In the absence of DOD-wide policies and processes, DOD officials stated that the responsibility for determining the extent of chemical and biological survivability consideration or testing has fallen largely on the individual weapon system program offices, in consultation with each service sponsor. However, program offices also lack specific guidance and a clear process governing the extent to which chemical and biological survivability should be considered or tested. In our review of nine weapon system programs, we found that the program offices exercised broad discretion over whether or to what extent to evaluate the need for and benefit of conducting chemical and biological survivability testing. Although all nine of these program offices had conducted or were considering some kind of testing, we found that the extent and nature of this testing varied widely, even for similar types of systems. For example, the two sea-based weapon system program offices we reviewed considered chemical and biological testing differently, even though both systems are intended for similar operating environments. The program offices for the three land systems we reviewed also conducted very different tests from one another, although these systems also are intended for the same operating environment.

Many factors affected the program offices' determination about the extent to test a weapon system's chemical and biological survivability, including the type of system (air, land, or sea), required system capabilities, system concept of operation, perceived chemical and biological threat, and other factors relating to the status of system cost, schedule, and performance. A more detailed discussion of the testing conducted for the nine weapon system programs we reviewed can be found in appendix II.

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## Program Offices Did Not Consistently Document Chemical and Biological Survivability Decisions

The nine weapon system program offices we reviewed did not consistently document their decisions regarding how they considered or tested chemical and biological survivability. Although they could provide documentation regarding what survivability testing was conducted, they did not have a consistent method to track what was considered or was not included, because there is no DOD, joint, or service requirement for program offices to document these decisions. DOD officials stated that there is currently no DOD-level process for documenting how weapon system program offices determined whether to consider or test chemical and biological survivability.

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## DOD Lacks Effective Survivability Oversight

There is no effective DOD-level oversight of how chemical and biological survivability is considered by weapon system program offices. In 1993, Congress directed the Secretary of Defense to designate an office as the single DOD focal point for chemical and biological defense matters.<sup>16</sup> DOD subsequently identified the Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs as the single DOD focal point for chemical and biological defense matters.<sup>17</sup> However, the military services and various offices within DOD never adopted a consistent method for incorporating chemical and biological survivability and related testing into major weapon system development acquisition, including oversight responsibilities. Between 1994 and 2004, GAO and DOD Inspector General reports identified multiple management and oversight process problems regarding the incorporation of chemical and biological survivability into weapon system development. Various military service acquisition offices and DOD agencies, such as the U.S. Army Nuclear Chemical Agency, and the office of the Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense, held differing views as to where this responsibility resided and how chemical and biological survivability should be incorporated into weapon system development. These differing views have hindered the development of an oversight process and prevented effective monitoring of weapon system program office decisions regarding chemical and biological survivability.

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<sup>16</sup>National Defense Authorization Act for Fiscal Year 1994, Pub. L. No. 103-160, Section 1701 (Nov. 30, 1993).

<sup>17</sup>The Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs falls under the Under Secretary of Defense for Acquisition, Technology and Logistics.

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Although the Office of the Assistant Secretary of Defense for Nuclear and Chemical and Biological Defense Programs directed the development and issuance of DOD's August 2005 interim report, DOD continues to lack a clear and effective department-level process for overseeing the inclusion of chemical and biological survivability in weapon system development.

In addition, according to DOD officials, no single joint organization, such as the Joint Requirements Oversight Council<sup>18</sup> or the Joint Requirements Office,<sup>19</sup> specifically monitors or tracks whether weapon system chemical and biological survivability is considered in the weapon system acquisition process. There also is no specific chemical and biological survivability Functional Capabilities Board<sup>20</sup> to review program office survivability decisions. DOD officials stated that these joint oversight organizations do not have a role in overseeing weapon system chemical and biological survivability and that consideration of survivability requirements during the acquisition process is therefore service-specific. Furthermore, because chemical and biological survivability is not usually a key performance parameter<sup>21</sup> for a weapon system, it is often traded off to satisfy other pressing requirements dealing with the weapon system cost, schedule, or performance. DOD officials we spoke with acknowledged that program cost and schedule concerns could reduce the amount of chemical and biological weapon system survivability testing conducted. While the Milestone Decision Authority focuses on requirements associated with key

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<sup>18</sup>The Joint Requirements Oversight Council is an advisory council that assists the Chairman of the Joint Chiefs of Staff in identifying and assessing the priorities for joint military requirements to achieve current and future military capabilities. Chaired by the Vice Chairman of the Joint Chiefs of Staff, the Council comprises a senior officer from each of the military services. Representatives from other DOD entities, such as the combatant commands and the joint staff, serve in an advisory role to the Council.

<sup>19</sup>The Joint Requirements Office is the office within DOD responsible for the planning, coordination, and oversight of joint chemical, biological, radiological, and nuclear defense operational requirements. It also serves as the Chairman, Joint Chiefs of Staff's single source of expertise to address all issues involving chemical, biological, radiological, and nuclear defense within passive defense, consequence management, force protection, and homeland security.

<sup>20</sup>A Functional Capabilities Board is a permanently established body that is responsible for the organization, analysis and prioritization of joint warfighting capabilities within an assigned functional area.

<sup>21</sup>Key performance parameters are those attributes or characteristics of a system that are considered critical or essential to the development of an effective military capability and those attributes that make a significant contribution to the key characteristics.



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performance parameters, none of the nine weapon systems we reviewed included chemical and biological survivability as a key performance factor. Only specific chemical and biological equipment—such as detection, protection, and decontamination equipment—have identified chemical and biological survivability as a key performance parameter.

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## Comprehensiveness of Chemical and Biological Survivability Information in DOD's Centralized Database Is Unknown

DOD, through DTIC, maintains a centralized database for science and technology information that could facilitate program offices' consideration of weapon system chemical and biological survivability, but the comprehensiveness of the survivability information in this database is unknown. We found it unlikely that this database is comprehensive for three reasons: (1) DOD policy is unclear as to whether chemical and biological information is covered by the policy, (2) no process has been established governing how information should be submitted to DTIC, and (3) no office or organization is responsible for overseeing that information is submitted to DTIC.

It is unclear whether chemical and biological survivability information is covered by the broad DOD policy directing that scientific and technical information be submitted to DTIC. This policy requires that DTIC be provided with copies of DOD-sponsored scientific and technical information, but does not specifically address whether chemical and biological survivability information is included. Some DOD officials involved in chemical and biological survivability research and/or testing told us that they believed they were not required to submit the results of their work to DTIC. Further, there is no established process for submitting chemical and biological information to DTIC.<sup>22</sup> As a result, individual personnel and organizations submit information to DTIC through ad hoc actions, and some DOD officials expressed concern that not all information is submitted to DTIC as required.

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<sup>22</sup>DOD Instruction 3200.14, "Principles and Operational Parameters of the DOD Scientific and Technical Information Program", May 13, 1997, states that a manual should be developed prescribing procedures, practices, standards, and training guides necessary to implement a comprehensive, efficient, and effective DOD scientific and technical information program, including a process for submitting research and testing results to a central database. However, such a manual has not been developed. DOD officials told us that they do not intend to develop such a manual and that reference to this manual will be removed from future versions of the DOD instruction.

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Finally, no office or organization in DOD has been clearly designated as responsible for exercising oversight to ensure that chemical and biological research and testing results are submitted to DTIC. The DOD instruction addressing management of the collection of scientific and technical information assigns responsibility for submitting research and testing results to the DOD activities involved,<sup>23</sup> but this instruction does not specifically indicate whether the activity sponsoring or approving the work or, alternatively, the organization performing it is responsible for its submission to DTIC. Officials at the DOD research and testing facilities we visited told us they routinely submitted the results of their work to DTIC, and we observed that DTIC and CBIAC were storing large amounts of this information. The two major DOD chemical and biological research and testing facilities we visited had an oversight process in place for ensuring that all research and testing projects submitted the required information to DTIC. However, responsibility for submitting this information was either left to individual research or testing staff, or was presumed to have been submitted to DTIC by the program offices requesting the work. DTIC officials stated that DTIC was not responsible for ensuring that DOD research and testing facilities submitted all research and testing results, and that DTIC had neither the authority nor the desire to do this. We could not identify any military service or program office level oversight for ensuring that research and testing results were submitted to DTIC, and some of the program offices we visited said the submission of research and test results to DTIC was not their responsibility. The absence of an internal control for ensuring that research and test results are submitted to DTIC and entered in DTIC's database could result in unnecessary expenditures on duplicative work. For example, if research or testing is performed regarding an aspect of survivability, but its results not entered in the DTIC database, officials in another program office interested in the same research or testing might fail to recognize it had already been performed and cause this work to be done again.

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<sup>23</sup>See DOD Instruction 3200.14, "Principles and Operational Parameters of the DOD Scientific and Technical Information Program," May 13, 1997, which states, "Primary distribution of all documents regardless of form, shall be the responsibility of the DOD activity that performed or sponsored the work in whole or in part. Primary distribution shall be to the technical community having a direct and immediate interest in the outcome of the research and evaluation or studies efforts. The DTIC, applicable DOD Information Analysis Centers, and the local DOD technical library or repository that supports the activity responsible for sponsoring and creating the documents shall be recipients of the primary distribution at the same time."

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## Conclusions

The issues identified in previous DODIG and GAO reports regarding weapon system incorporation of chemical and biological survivability during the system acquisition process remain largely unresolved. Without DOD establishing consistent policy requiring that chemical and biological survivability be considered during weapon system acquisition and establishing a clear process for doing so, the incorporation of chemical and biological survivability into major weapons system acquisition is likely to remain varied and inconsistent. Consequently, military planners and commanders are likely to face varying weapon system performance, availability, and interoperability issues. This, in turn, could complicate the planning and execution of operations and increase the risk of mission failure, because systems that are not chemically or biologically survivable but become exposed to chemical or biological agents may not be available to a combatant commander for reuse in critical missions, such as deploying or supplying troops. Furthermore, without consistent documentation of program offices' rationales for trade-off decisions in their consideration of weapon system chemical and biological survivability, DOD's ability to identify and analyze associated risks could be hindered. Finally, the absence of a clearly defined DOD-level process for overseeing military service and program office actions limits DOD's ability to ensure that appropriate weapon system survivability decisions are being made.

Without clarifying existing policies regarding which research and testing information should be submitted, the process to be used for submitting it, and which DOD offices or organizations are responsible for overseeing its submission, DTIC will likely be unable to ensure the maintenance of a centralized database containing comprehensive chemical and biological research and testing information. This could limit DOD's ability to efficiently and economically assess the effects of chemical and biological agent contamination on weapon system components and materials, and could result in duplicative research and testing, thus causing unnecessary design and development costs.

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## Recommendations for Executive Action

To better ensure the incorporation of chemical and biological survivability into weapon systems, we recommend that the Secretary of Defense direct the Under Secretary of Defense for Acquisition, Technology, and Logistics to take the following six actions:

- 
- Either modify current DOD policy or develop guidance to ensure that chemical and biological survivability is consistently addressed in the weapon system acquisition process. This policy or guidance should
    - establish a clear process for program offices to follow regarding the extent to which chemical and biological system survivability should be considered and tested;
    - require consistent, DOD-wide documentation of decisions regarding how weapon system chemical and biological survivability is considered and tested; and
    - establish an oversight process within DOD and the services for monitoring weapon system program office decisions;
  - modify current DOD policy to ensure that DOD's database of chemical and biological scientific and technical information is comprehensive. This modified policy should
    - state which chemical and biological survivability information belongs in the body of scientific and technical information that is required to be submitted to DTIC;
    - clarify responsibilities and establish a specific process for the submission of chemical and biological scientific and technical information to DTIC; and
    - designate which DOD office or organization is responsible for exercising oversight to ensure that this information is submitted to DTIC.

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## Agency Comments and Our Evaluation

In commenting on a draft of this report, DOD concurred with all recommendations. Regarding our recommendations for either modifying current DOD policy or developing guidance to ensure that chemical and biological survivability is consistently addressed in the weapon system acquisition process, DOD plans to issue a Chemical Biological Contamination Survivability Policy by May 2006 and subsequently draft a DOD Directive addressing Chemical, Biological, Radiological, and Nuclear Survivability. With regard to our recommendations for modifying current DOD policy to ensure that DOD's database of chemical and biological scientific and technical information is comprehensive, DOD initiated the

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development of a chemical and biological material effects database by forming and hosting an executive steering committee that met for the first time in March 2006. DOD plans to establish and institute this database at the Chemical and Biological Defense Information and Analysis Center (CBIAC) managed by the Defense Technical Information Center (DTIC). The Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs is overseeing the development of this database, which DOD expects to be ready by the end of Fiscal Year 2007. DOD's comments are reprinted in appendix III. DOD also provided technical comments, which we have incorporated as appropriate.

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We are sending copies of this report to the Secretaries of Defense, the Air Force, the Army, the Navy, and the Commandant of the Marine Corps; and the Director, Office of Management and Budget. We will make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff members have any questions regarding this report, please contact me at (202) 512-5431 or [dagostinod@gao.gov](mailto:dagostinod@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix IV.

A handwritten signature in black ink, appearing to read "Davi M. D'Agostino". The signature is fluid and cursive, with the first name "Davi" and last name "Agostino" being more prominent.

Davi M. D'Agostino  
Director, Defense Capabilities and Management

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The Honorable C. W. Bill Young  
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# Scope and Methodology

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To assess the extent to which DOD addresses weapon system chemical and biological survivability during the acquisition process, we reviewed DOD, joint staff, and service policies, guidance, and procedures and interviewed officials throughout DOD. We also conducted a non probability sample of nine major weapon systems.<sup>1</sup> We selected programs for this non probability sample based on several factors, including (1) high dollar value,<sup>2</sup> (2) whether the weapon system was a joint program, and (3) risk of exposure to chemical and biological weapons. The methodology used to select our sample helped achieve a sample of weapon systems that was both diverse and relevant to chemical and biological survivability. For example, the sample includes weapon systems from all military services and all types of systems-land, sea, and air. The sample also includes both legacy systems and those currently in development. To understand how DOD's acquisition, testing, and data submission and storage policies affect weapon systems program offices' practices, we spoke with officials and examined documentation from the nine weapon system program offices we reviewed. The list of selected weapons systems is provided below:

- C-17 Globemaster
- DD(X) Destroyer
- Expeditionary Fighting Vehicle
- F/A-22 Raptor
- Future Combat Systems
- Joint Strike Fighter
- Littoral Combat Ship
- Stryker Infantry Carrier

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<sup>1</sup>Because the sample is a non probability sample, it cannot be used to make generalizations about weapon system program office acquisition, testing, or database submission practices related to chemical and biological survivability.

<sup>2</sup>Seven of nine of the programs covered in this report are considered major defense acquisition programs by DOD. A program is defined by DOD as major if its estimated research and development costs exceed \$365 million or its procurement exceeds \$2.19 billion in fiscal year 2000 constant dollars.

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- V-22 Osprey Vertical Lift Aircraft

To determine the extent to which DOD maintains a comprehensive database for facilitating the inclusion of chemical and biological survivability in weapons system design and development, we reviewed DOD and service policies, guidance, and procedures. We compared these policies, guidance, and procedures to the objectives and fundamental concepts of internal controls defined in Standards for Internal Control in the Federal Government. We also conducted interviews with database officials and members of the chemical and biological testing community and reviewed documents at the following locations in consultation with DOD officials and identified as crucial to this subject area in previous GAO reports:

- Air Force Research Laboratory, Dayton, Ohio
- Army Research Laboratory, Survivability and Lethality Analysis Directorate, Aberdeen, Maryland
- Chemical and Biological Information Analysis Center, Edgewood, Maryland
- Defense Technical Information Center, Fort Belvoir, Virginia
- West Desert Test Center, Dugway Proving Ground, Utah
- Defense Threat Reduction Agency, Alexandria, Virginia

We conducted our review from February 2005 through January 2006 in accordance with generally accepted government auditing standards.



# Sampled Weapon System Programs Either Conducted or Considered Some Level of Chemical and Biological Survivability Testing

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We conducted a non probability sample of nine weapon system programs and found that all conducted or were considering some kind of system survivability testing. The survivability of the weapon system programs we reviewed was tested by an array of testing procedures and a variety of simulated and live chemical and biological agents and decontamination solutions. Seven conducted either coupon<sup>1</sup> testing of materials or component testing. In a few cases, chemical and biological survivability testing was only conducted at the weapons system level and not at the coupon or component level. All of the weapon system program offices we interviewed conducted literature searches, discussions with subject matter experts, and consulted with testing facilities and organizations (such as the West Desert Test Center) to develop their chemical and biological survivability testing strategy. Figure 2 shows the different types of testing related to chemical and biological survivability that had been performed on the selected weapon systems at the time of our review. This figure does not reflect either planned or unplanned survivability testing that might be performed with regard to these systems in the future.

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<sup>1</sup>A coupon-or-swatch is a test specimen cut from a bolt of material. The swatch should be selected to be representative of the area of the material to be tested.

**Appendix II**  
**Sampled Weapon System Programs Either**  
**Conducted or Considered Some Level of**  
**Chemical and Biological Survivability Testing**

**Figure 2: Chemical and Biological Testing Performed on Sampled Weapon Systems**

| Most Sampled Programs Included Consideration of Chemical and Biological Survivability |   |                             |                   |                |
|---|---|-----------------------------|-------------------|----------------|
| Weapon system   |   | Coupon testing <sup>1</sup> | Component testing | System testing |
| ① Stryker Infantry Carrier  |    |                             |                   | 1              |
| ② Future Combat Systems   |    | 2                           | 2                 | 2              |
| ③ Expeditionary Fighting Vehicle  |    | 1                           |                   |                |
| ④ DD(X) Destroyer   |   | 1                           |                   |                |
| ⑤ Littoral Combat Ship  |  | 3                           | 3                 | 3              |
| ⑥ V-22 Osprey Vertical Lift Aircraft  |  | 1                           | 1                 |                |
| ⑦ F/A-22 Raptor   |  | 1                           | 1                 |                |
| ⑧ C-17 Globemaster  |  | 1                           |                   |                |
| ⑨ Joint Strike Fighter  |  | 1                           | 1                 |                |

① Weapon system conducted testing at either the coupon, component, or system level.

② Weapon system in design phase. Specific procedures for the consideration of chemical and biological survivability not developed.

③ Concept of operations precludes this vehicle from operating in a chemical or biological contaminated environment.

<sup>1</sup>Note: A coupon-- or swatch-- is a test specimen cut from a bolt of material. The swatch should be selected to be representative of the area of the material to be tested.

Sources: Army: 1, 2; Navy: 4, 5-(Littoral Combat Ship Program Office); Marine Corp: 9, 3-(General Dynamics Land System); Air Force: 6, 7, 8. GAO analysis of DOD data.

**Program Offices' Chemical and Biological Survivability Testing Varied for Reviewed Weapon Systems**

We found that the extent and nature of chemical and biological survivability testing varied widely in all nine weapon systems we reviewed, even for similar types of systems. Both sea-based weapon systems we reviewed exhibited varying consideration of chemical and biological testing. For example, the Navy's Littoral Combat Ship (LCS) program office

considered chemical and biological survivability testing low-risk due to the perceived operating environment and concept of operations for this weapon system. Officials stated that the key survivability approach will be to reduce susceptibility to contamination through detection and avoidance. In contrast, the Navy's next generation destroyer DD(X) was designed with a higher chemical and biological system protection level, and consequently the program office conducted limited coupon testing of specific materials found in the ship's superstructure.<sup>2</sup> In its technical comments on this report, DOD stated that this occurred because the DD(X) concept of operations does not preclude exposure to chemical and biological attacks, while the LCS concept of operations does preclude exposure to chemical and biological agents. These systems thus utilized different concepts of operations although both are intended to operate in a littoral environment.

DOD and program officials stated that land systems would be those most likely to include chemical and biological survivability testing because of the increased likelihood of encountering contamination on the modern battlefield. However, these programs also conducted tests very different from each other although they are intended for the same operating environment. The Marine Corps' Expeditionary Fighting Vehicle program office conducted four chemical and biological materials tests that looked at the effects of decontaminants on a variety of materials and included extensive tests using Chemical Agent Resistant Coating on the exterior and interior of the vehicle. In comparison, program officials from the Army's new wheeled personnel carrier, Stryker, used a different approach, focusing on applying a chemical agent simulant to a complete Stryker vehicle and then conducting decontamination procedures. However, in this case a different testing approach for a similar system may have been appropriate because the Stryker is not constructed with new materials and all existing materials used in constructing the Stryker meet military specification requirements for chemical and biological survivability. The Army's Future Combat System is currently reassessing chemical and biological survivability in its design and development. This program is still in development and has not reached the point where definitive decisions on chemical and biological survivability are applicable. The Army sponsor and the program office have been coordinating with the Joint Requirements Oversight Council, U.S. Army Nuclear and Chemical Agency, and the Army

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<sup>2</sup>The DD(X) program office stated that there are plans for additional production testing (at both the component and total system level) to include the Countermeasure Washdown System, Chemical Detection Systems, and the Collective Protection System.

Training and Doctrine Command in creating chemical and biological survivability requirements.

Of the four aircraft weapon system programs we sampled, three conducted similar levels of chemical and biological testing. Of the three current systems, the Air Force's F/A-22 Raptor and Joint Strike Fighter program offices conducted testing as extensive as that conducted by the Navy for the V-22 Osprey, although these two systems were assessed as much less likely to encounter chemical and biological contamination as the V-22 Osprey. The V-22 Osprey program office performed vulnerability assessments, survivability assessments, and some material coupon tests. Both the Air Force Joint Strike Fighter and F/A-22 Raptor program offices conducted complementary material and component contamination and decontamination compatibility tests. To identify material survivability issues, the F/A-22 Raptor program office contracted with a defense contractor to perform a literature search in advance of any testing. The Joint Strike Fighter program office effectively employed the results of this F/A-22 Raptor testing performed by using the survivability manual developed for the F/A-22 Raptor rather than developing its own. This manual was effectively used as a reference to meet both program's chemical and biological survivability and decontamination thresholds following exposure to chemical and biological weapons and decontamination procedures. The legacy aircraft system we reviewed, the C-17, conducted little chemical and biological testing because much of its testing and development occurred during a different threat environment. Program officials stated that decontamination procedures for the C-17 were developed in the 1980s and that the chemical and biological survivability requirements were drastically scaled down after the end of the Cold War.

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## Variety of Factors Affected Testing Decisions

Many factors affected the program office's determination about the extent to test a weapon system's chemical and biological survivability. These factors included the type of system (i.e., air, land, or sea), required system capabilities, system concept of operation, the perceived chemical and biological threat, and other factors related to the status of system cost, schedule, and performance. Senior DOD officials stated that each service sponsor has the ability to choose whether to accept the risks related to cost and schedule to incorporate testing of chemical and biological survivability.

DOD officials stated that in general land systems are perceived as the most likely to encounter chemical and biological contamination and that the

perceived threat for sea and air systems has traditionally been considered lower than the perceived threat for land systems. This perception was based on old Cold War concepts and has since changed. DOD officials told us that asymmetric threats are a greater concern today and that system developers must weigh the threat context as they are developing systems and deciding what types of survivability to test based on perceived risk.

Program offices we visited stated that the high financial cost of both live and simulated chemical and biological agent testing was a factor that influences decisions about testing weapon system chemical and biological survivability. For example, officials at the Expeditionary Fighting Vehicle program office estimated that coupon testing with live agents could cost approximately \$30,000 to \$50,000, and full system, live agent field testing of equipment at a facility such as the West Desert Test Center at Dugway Proving Grounds would cost approximately \$1 million. In addition, the C-17 program office stated that live agent testing cost approximately \$1 million. Interviews with various DOD research facilities where testing is conducted supported these amounts. F/A-22 program officials also stated that although they conducted coupon and component tests, they would not encourage a full system chemical and biological survivability test because such a test would be too expensive and would destroy the aircraft being tested.

# Comments from the Department of Defense



NUCLEAR AND CHEMICAL  
AND BIOLOGICAL DEFENSE  
PROGRAMS

ASSISTANT TO THE SECRETARY OF DEFENSE  
3050 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3050

APR 20 2006

Ms. Davi M. D'Agostino  
Director, Defense Capabilities and Management  
U.S. Government Accountability Office  
441 G Street, N.W.  
Washington, DC 20548

Dear Ms. D'Agostino:

This is the Department of Defense (DoD) response to the Government Accountability Office (GAO) draft report, "CHEMICAL AND BIOLOGICAL DEFENSE: DoD Needs Consistent Policies and Clear Processes to Address the Survivability of Weapon Systems Against Chemical and Biological Threats," dated April 4, 2006 (GAO Code 350641/GAO-06-592). The DoD concurs with the draft report and our responses to the recommendations, along with other comments, are enclosed.

The DoD is in the process of addressing Public Law 108-375, which parallels findings from the May 2003 GAO Report (GAO-03-325C). As a result of this law, the DoD is implementing the following tasks: development of definitions, policies, and procedures; analysis and test support; support plan; chemical and biological materials effects database; and development of an oversight process.

The DoD will issue a final Chemical Biological Contamination Survivability Policy by May 2006, along with an updated Report to Congress. This final policy will replace the interim policy issued last year. After the final policy is issued, the DoD will draft a Department of Defense Directive that will address chemical, biological, radiological, and nuclear survivability.

The DoD formed an Executive Steering Committee to execute the development of a materials effects database. This committee held their kick-off meeting March 21 2006.

Should you have any questions, please phone or e-mail the point of contact, Mr. Anthony Lee, [anthony.lee@osd.mil](mailto:anthony.lee@osd.mil), 703-695-5486.

Sincerely,

A handwritten signature in black ink, appearing to read "Dale Klein", is written over a horizontal line.

Dale Klein

Enclosure:  
As stated

GAO DRAFT REPORT – DATED APRIL 4, 2006  
GAO CODE 350641/GAO-06-592

**“CHEMICAL AND BIOLOGICAL DEFENSE: DoD Needs Consistent Policies and  
Clear Processes to Address the Survivability of Weapon Systems Against Chemical  
and Biological Threats”**

**DEPARTMENT OF DEFENSE COMMENTS  
TO THE RECOMMENDATIONS**

**RECOMMENDATION 1:** To better ensure the incorporation of chemical and biological survivability into weapon systems, the GAO recommends that the Secretary of Defense direct the Under Secretary of Defense for Acquisition, Technology, and Logistics to either modify current DoD policy or develop guidance to ensure that chemical and biological survivability is consistently addressed in the weapon system acquisition process. This policy or guidance should:

- establish a clear process for program offices to follow regarding the extent to which chemical and biological system survivability should be considered and tested;
- require consistent, DoD-wide documentation of decisions regarding how weapon system chemical and biological survivability is considered and tested; and
- establish an oversight process within DoD and the Services for monitoring weapon system program office decisions. (Page 24/GAO Draft Report)

**DOD RESPONSE:** Concur. The Office of the Special Assistant for Chemical and Biological Defense and Chemical Demilitarization Programs (SA(CBD&CDP)) developed a draft policy to address chemical and biological contamination survivability (CBCS). This draft policy establishes a process for materiel developers to follow to determine: (1) which systems must address CBCS, (2) how CBCS will be addressed through the Joint Capabilities Integration and Development System (JCIDS), (3) implementation of this process, and (4) the development of quantitative and measurable performance attributes with thresholds and objectives. The draft policy mandates the use of the JCIDS process in satisfying CBCS requirements and annual reporting of CBCS-related program decisions. The draft policy directs the Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs (ATSD(NCB)) to provide oversight of the CBCS program and provides a process for this oversight. This draft policy was reviewed by all the Military Services and is expected to be issued by May 2006.

Now on p. 16.

**RECOMMENDATION 2:** To better ensure the incorporation of chemical and biological survivability into weapon systems, the GAO recommends that the Secretary of Defense direct the Under Secretary of Defense for Acquisition, Technology, and Logistics to modify current DoD policy to ensure that DoD's database of chemical and biological scientific and technical information is comprehensive. This modified policy should:

- state which chemical and biological survivability information belongs in the body of scientific and technical information that is required to be submitted to the Defense Technical Information Center (DTIC);
- clarify responsibilities and establish a specific process for the submission of chemical and biological scientific and technical information to DTIC; and
- designate which DoD office or organization is responsible for exercising oversight to ensure that this information is submitted to DTIC. (Pages 24-25/GAO Draft Report)

**DOD RESPONSE:** Concur. The DoD recognizes the need for a chemical and biological material effects database. The DoD initiated development of such a database by forming and hosting an executive steering committee which met for the first time in March 2006. The DoD plans to establish and institute this database at the Chemical and Biological Defense Information and Analysis Center (CBIAC) managed by the Defense Technical Information Center (DTIC). The CBCS Database Executive Steering Committee is addressing such issues as data selection, database population, and data submission. The ATSD(NCB) oversees development of this database, which is expected to be ready by the end of Fiscal Year 2007.

Now on p. 16.



# GAO Contact and Staff Acknowledgments

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## GAO Contact

Davi M. D'Agostino, (202) 512-5431 or [dagostinod@gao.gov](mailto:dagostinod@gao.gov)

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## Acknowledgments

In addition to the contact named above, William Cawood, Assistant Director; Renee S. Brown, Jane Ervin, Catherine Humphries, David Mayfield, Renee McElveen, Anupama Patil, Matthew Sakrekoff, Rebecca Shea, and Cheryl Weissman also made key contributions to this report.

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